

A Computational Tool for the Prediction of Long Term Stability of Refractory Alloys, Phase I

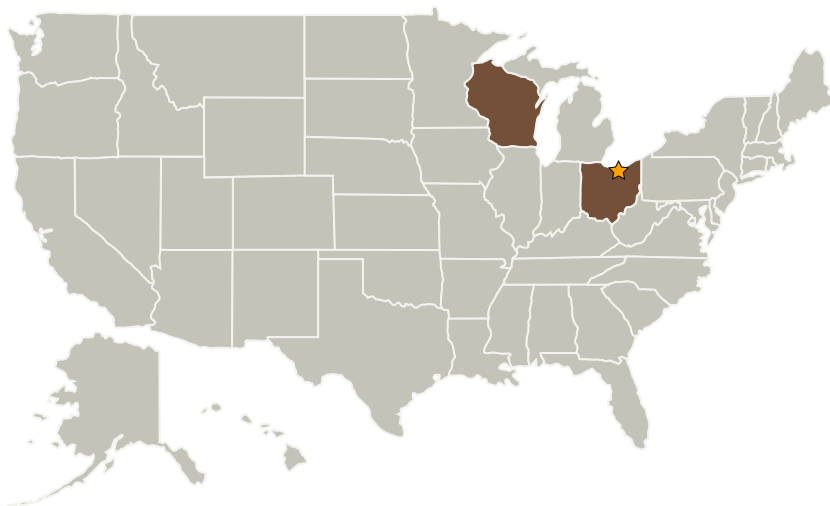
Completed Technology Project (2006 - 2006)



Project Introduction

NASA's missions of space exploration require significant power sources both for propulsion and for on-board power. This motivates the development of high temperature structural materials to maximize the thermodynamic efficiency of power conversion systems. Refractory alloys are essential due to their high operating temperature capability that in turn enables high thermal conversion efficiency. The overall objective of the proposed study is to provide NASA with a simulation tool that can be used to improve the performance of current available refractory alloys and accelerate the development of new refractory alloys with desired properties for space nuclear applications. The tool will include: (1) A thermodynamic database for the multi-component RM-TM-IE system, in which RM represents refractory metals including Nb, Mo, Ta, W, and Re; TM represents transition metals including Ti, Zr, and Hf; and IE represents interstitial elements, such as C, N, and O. (2) A mobility database for the multi-component RM-TM-IE system; (3) A computer software package with needed functions for thermodynamic calculations, kinetic simulations, and user-friendly interface. In Phase I, the tool will be developed for the Nb-Zr-C sub-system to examine the feasibility. In Phase II, its applications will be extended to multi-component RM-TM-IE refractory alloy systems.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
CompuTherm, LLC	Supporting Organization	Industry	Madison, Wisconsin

Primary U.S. Work Locations

Ohio	Wisconsin
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.1 Cryogenic Systems
 - └ TX14.1.3 Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors